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AMENDMENTS TO THE CLAIMS

Please amend Claims 54, 61, 68 and 78 as follows.

1 ~ 50 (Previously cancelled)

51. (Previously amended) An electron source comprising:

a substrate;

a field emitter, a body of the field emitter being a whisker epitaxially grown on the substrate;

a source of charge carriers supplying the field emitter; and

at least one ballast resistor configured as a barrier between different materials located in or proximate to the field emitter.

52. (Previously added) The electron source of Claim 51, wherein the substrate comprises an insulating layer and a conductive layer.

53. (Previously added) The electron source of Claim 52, wherein at least one barrier is formed within the conductive layer of the substrate.

54. (Currently amended) The electron source of Claim 51, wherein the substrate is a single crystal with (111) orientation.

55. (Previously added) The electron source of Claim 51, wherein the field emitter comprises at least one semiconductor material.

56. (Previously added) The electron source of Claim 51, wherein at least one barrier is formed, in part, by an insulating layer that is perpendicular to the direction of charge carrier flow.

57. (Previously amended) The electron source of Claim 51, wherein the different materials are semiconductors with opposite conductivity.

58. (Previously added) The electron source of Claim 51, wherein an end of the field emitter comprises a narrow tip.

59. (Previously added) The electron source of Claim 58, wherein the tip of the field emitter is sharpened and coated by diamond or diamond-like material.

60. (Previously added) The electron source of Claim 59, wherein the diamond or diamond-like material is sharpened.

61. (Currently amended) The electron source of Claim 51, wherein the field emitter comprises two coaxial parts, a broad lower part and a narrower ~~outerupper~~ part.

62. (Previously added) The electron source of Claim 51, wherein the barrier is formed within the field emitter body.

63. (Previously added) The electron source of Claim 51, wherein the barrier is formed between the field emitter body and a conducting layer placed directly on a surface of the field emitter.

64. (Previously added) The electron source of Claim 63, wherein the conducting layer comprises at least one semiconductor material.

65. (Previously added) The electron source of Claim 63, wherein there is an insulating layer at least part way between the conducting layer and the surface of the field emitter.

66. (Previously amended) The electron source of Claim 63, wherein the source of the charge carriers is the conducting layer on the surface of the field emitter.

67. (Previously amended) An electron source comprising:

a substrate;

a field emitter, a body of the field emitter configured as a whisker epitaxially grown on the substrate;

a source of charge carriers supplying the field emitter; and

at least one ballast resistor configured as a junction between semiconductor materials with opposite conductivities located in or proximate to the field emitter.

68. (Currently amended) The electron source of Claim 67, wherein the substrate is a single crystal with (111) orientation.

69. (Previously amended) A controlled electron source comprising:

a substrate having a surface and a field emitter extending from the surface;

a field emitter having a side surface with an insulating layer covering at least a portion of the side surface;

a source of charge carriers supplying the field emitter;

at least one ballast resistor configured as a junction between materials with opposite conductivities located in or proximate to the field emitter; and

at least one control electrode in proximity to the junction.

70. (Previously added) The controlled electron source of Claim 69, wherein the field emitter, having a body, contains at least one active area that is at least, in part, in the body.

71. (Previously added) The controlled electron source of Claim 69, wherein a conducting layer covers at least part of the surface of the substrate and at least part of the surface of the field emitter, the layer containing at least, in part, one or more active areas.

72. (Previously added) The controlled electron source of Claim 69, wherein at least one control electrode is placed close enough to the junction to influence a flow of charge carriers therein.

73. (Previously added) The controlled electron source of Claim 69, wherein at least one control electrode is separated from the field emitter by a vacuum gap.

74. (Previously added) The controlled electron source of Claim 69, wherein at least one control electrode is placed along the side surface of the field emitter.

75. (Previously added) The controlled electron source of Claim 74, wherein the control electrode has direct contact with the side surface of the field emitter.

76. (Previously added) The controlled electron source of Claim 69, wherein a surface of the field emitter is coated by a material which is transparent to electrons, and which prevents outlet of chemical elements from the field emitter.

77. (Previously added) The controlled electron source of Claim 76, wherein the material comprises diamond or diamond-like carbon.

78. (Currently amended) A matrix system of controlled electron sources arranged on a substrate, the system comprising:

at least two controlled electron sources arranged on the substrate, each of the electron sources comprising a whisker epitaxially grown on the substrate and a junction between semiconductor materials with opposite conductivities; and

parallel rows of conductive material on an insulating layer covering the substrate.

79. (Previously added) The matrix system of Claim 78, wherein the system is a two-dimensional array of the controlled electron sources arranged in rows that are approximately perpendicular to one another.

80. (Previously amended) The matrix system of Claim 78, wherein the controlled electron sources receive electrical input from two sets of approximately parallel conductive buses that are approximately perpendicular to each other and that are separated from each other by an insulating layer.

81. (Previously amended) The matrix system of Claim 78, wherein at least one electron source has a diaphragm shape and comprises conductive diamond or diamond-like material.

82. (Previously amended) A method of preparation of a controlled electron source comprising:

forming the field emitter as a whisker epitaxially grown on the substrate;

forming within the field emitter at least one junction between materials having opposite electrical conductivities, the boundary configured approximately perpendicular to a long direction of the whisker; and

forming at least one control electrode close enough to the junction to affect junction conductivity when a voltage is applied to the control electrode.

83. (Previously added) The method of Claim 82, wherein forming the field emitter as a whisker is done using a vapor-liquid-solid method.

84. (Previously added) The method of Claim 82, wherein forming the field emitter as a whisker comprises forming a cavity in the substrate; and depositing a solvent particle at a bottom of the cavity.

85. (Previously added) The method of Claim 82, wherein the forming of the field emitter on a substrate comprises placing a solvent particle on the substrate and etching the substrate around the solvent particle.

86. (Previously amended) The method of Claim 82, wherein forming the field emitter on a substrate comprises:

depositing a solvent particle onto the substrate, the substrate having a first conductivity;

using a first source material having a second conductivity opposite to the first conductivity to grow a portion of a whisker having the second conductivity;

cooling the whisker, having a globule on its end, and also cooling the substrate using an inert gas;

removing the first source material;

heating the whisker having the globule on its end using an inert gas and the substrate; and

using a second source material having a first kind of conductivity to continue growing the whisker, thereby making a portion having the first conductivity.

87. (Previously amended) The method of Claim 86, wherein additional portions of the whisker are formed with alternating second and first conductivities.

88. (Previously amended) The method of Claim 82, wherein forming the field emitter comprises:

growing a whisker in a gas atmosphere that comprises elements of the substrate;

introducing doping gases into the gas atmosphere; and

changing the conductivity of the doping gases at least once while forming the field emitter.